



National Renewable Energy
Industry Roadmap 2020

REPAP
2020

Renewable Energy Policy Action Paving
the Way towards 2020

FUTURE DEVELOPMENT

of the RES in the Bulgarian energy system
regarding the Directive 2009/28/EC

REPORT

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Foreword

Renewable energy sources are a good way to tackle energy related challenges such as security of energy supply and global warming. Using all kinds of renewable technologies such as wind, sun, water, biomass, biofuels, hydrogen etc, means producing fewer carbon dioxide, particles and toxic emissions.

In the past, renewable energy has generally been more expensive to produce and use than fossil fuels. Renewable resources are often located in remote areas, and it is expensive to build power lines to the cities where the electricity they produce is needed. But now it is not just an exotic way of supplying energy, but also a way to keep the climate stable and the temperature rises moderate.

To change the recent status and to make a way for developing this promising industry we need a strong support from the governments and decision makers. A strong policy framework for promoting RES worldwide has to be built.

Recently obstacles for the development of the sector have come to light. Although Bulgaria has a good law for RES, the regulatory legal framework is quite complicated. There are several institutions involved and the changes which are made in one law, act or ordinance influence others and the whole investment or development process.

What is required is the creation of one unified statute-book or regulations for controlling the coming of the law into effect. Additionally only one institution should be in charge of administrating the law – it could be the Ministry of Economy, Energy and Tourism or other directorate/agency.

The initial costs for building RES-power plant are indeed high, but in the long-run there are zero fuel and waste storage costs and not more than 7-10% of the total income of the produced electricity goes for operation, maintenance and other costs.

The most important aspect is that by producing electricity from renewables, our country becomes independent. Independent of the price-unstable energy market and energy supplies and also to some extent economically independent.

1. Executive Summary

The **indicative target** for Bulgaria in 2020 is **16%** of the gross final energy consumption to be generated from renewable energy sources. In 2005 this share was estimated at 9.4%. With this document we aim to provide a breakdown of how our country will meet this target subsector by subsector up to the year 2020.

The **major net contributors** in the gross final energy production are the Heating and Cooling Energy Sector supported by the Electrical Energy sector. Respectively, they have generated 65% and 35% of the total renewable energy produced in 2005. Renewable energy sources have a very limited penetration in the overall energy consumption in the transport sector, thus contributing with a negligible effect on the total renewable energy mix of the country.

In terms of **energy mix**, the dominant power producers in Bulgarian energy sector are conventional fossil fuel power plants and the Kozlodui nuclear power plant responsible for respectively 39.5% and 45.6% of production of primary energy. Due to its energy mix, Bulgaria has become heavily dependent on energy fuel imports such as coal and nuclear fuel. This dependence, in addition to other critical factors such as economic growth, energy efficiency, decommissioning of obsolete plants and power grid development, has prompted the Bulgarian government to a more proactive support for the implementation of renewable energy technologies.

Dividing the RES-based generation capacity in three main sectors we have estimated the following **trajectories** up to the year 2020:

- The expected share of renewable energy generated from the **Electrical energy** sector will increase to 31.9% from the gross final electricity consumption in 2020, compared to 11.99% in 2005. The main driving force behind this rapid growth is the expected expansion of wind energy due to its relatively lower cost per installed capacity and maturity in its technological development compared to biomass, hydro, tidal, solar or geothermal energy sources.
- The expected share of renewable energy generated from the **Heating and Cooling energy** sector will decrease to 12.8% of the gross final energy consumption in 2020, compared to 17.44% in 2005. The main reason behind this is the tendency of

consumers to switch to electricity for heating at the expense of solid biomass which is cheaper but also low-tech and less efficient in terms of heat generation and emissions. Solar thermal and geothermal energy for heating purposes are expected to significantly improve— 40 ktoe and 30 ktoe in 2020 respectively. However, their capacity relative to the overall consumption in the sector and the general trend of an increase in energy consumption for heating and cooling itself will not be sufficient to keep the share of renewable energy on a par with the levels in 2005.

- The expected share of renewable energy in the **Transport sector** is somewhat difficult to predict due to the relevance of the mid-term strategy for development of the sector on national level. In general, based on expert judgment, we expect the gross final energy consumption in transport to decrease by 5% per annum, taking into account factors such as requirements for reduction of greenhouse gases, the average age of the vehicle park, possible increase in use of electricity in the sector through more intensive use of railroad transport and introduction of electric-powered automobiles. In terms of bio fuels, the production of 16.3% of the arable land fund must be put aside for energy production if Bulgaria tries to accomplish the 10% share of bio fuels from indigenous sources. Such a rapid penetration of energy cultures may disbalance the food supply. Therefore, it is expected significant part of the bio fuels to be imported instead of produced domestically.

2. The Current Situation in Bulgaria

The development of renewable energy sources is a priority policy of the European Union, including Bulgaria. As the potential of each member country varies both in terms of quantity and as a RES mix, each country has to elaborate its own plan for achieving its national target set out in Directive 2009/28/EC. For Bulgaria the binding target for 2020 is of 16% of the gross final energy consumption provided by renewable sources.

RES target za 2020 and Indicative trajectory	2005	Average	Average	Average	Average	2020
		2011-2012	2013-2014	2015 - 2016	2017-2018	
RES share in gross final energy consumption	9.40%	10.72%	11.38%	12.37%	13.69%	16%

Table 1. Binding overall target and indicative trajectory for RES share¹

In 2005 the share of the renewable energy sources in the gross final energy consumption in Bulgaria was 9.4%. The heat energy sector and electric power sector were the main contributors, accounting for respectively 65% and 35% of the energy generated from renewable energy sources. The contribution of the transport sector to the renewable energy mix of the country is negligible as practically there were no installed facilities for biofuel production as in 2007.

It is true, that there is considerable potential for renewable energy development in the three main sectors.

¹ The methods, as well as the initial and final value for the indicative curve up to 2020 are stipulated in Directive 2009/28/EC @ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF>

The electrical energy sector is the most dynamically developed, where, due to the feed-in tariff and the good legal framework, provided by the Renewable and Alternative Energy Sources and Biofuels Act of 2007 (RAESBA)², the barriers for investors were drastically reduced. The most perceivable effect is in the wind and solar industries that are yet to achieve their technical and economic potentials, unlike hydro energy, which has already reached its optimum.

Currently, the heat energy sector in Bulgaria is the main source to meet the energy needs of the country. The greatest contribution in the sector is that of solid biomass for heating. The sector has a considerable potential for integration of new technologies that will increase the renewable energy share and reduce the amount of harmful emissions.

In the transport sector, the main potential for development lies in the increase in the production and consumption of bio-derived fuels, as well as in the increase in the use of energy from renewable sources. Electrical energy may very quickly obtain a greater role in the transport sector due to the development of railway transport, public urban transport and the greater share of electric vehicles. According to EUROSTAT data, the share of biodiesel and bioethanol in overall consumption in the sector in Bulgaria was only 0.24% in 2006 and 0.10% in 2007, with a serious potential for development of own production facilities.

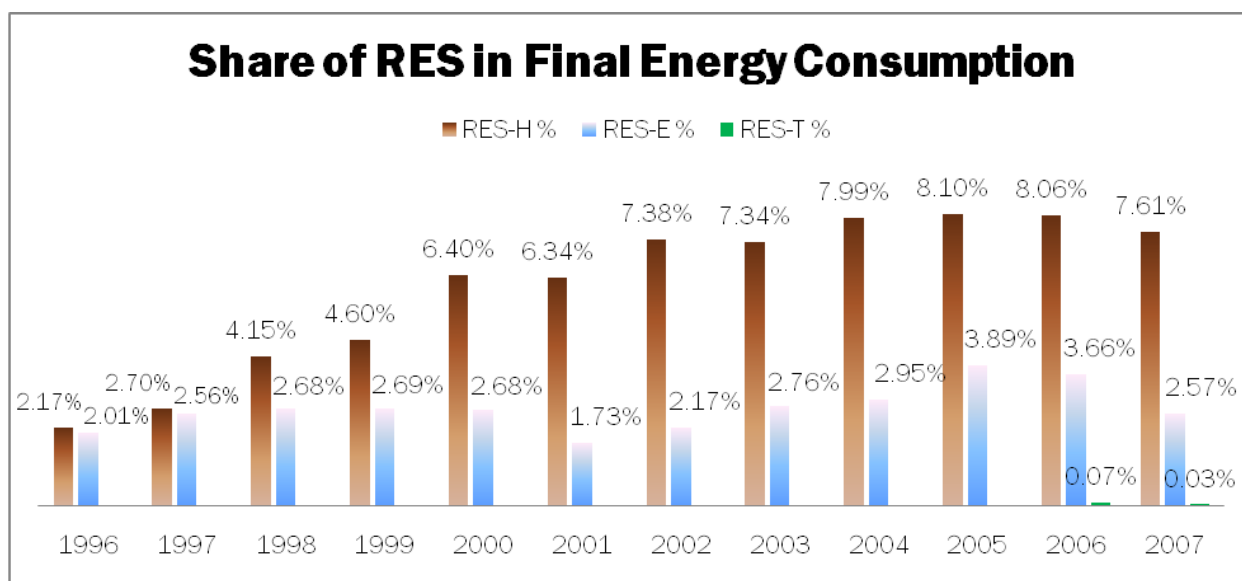


Figure 1. RES share in final energy consumption – by sectors³

² <http://www.mi.government.bg/norm/laws.html?id=293009>

³ Combination from an information excerpt from EUROSTAT http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/main_tables

2.1. Electrical energy sector

The RES share in the electrical energy sector in 2005 was 3.89% of gross final energy consumption, or 373 KTOE. In comparison, in 2007 this share was 2.57% or 251 KTOE.

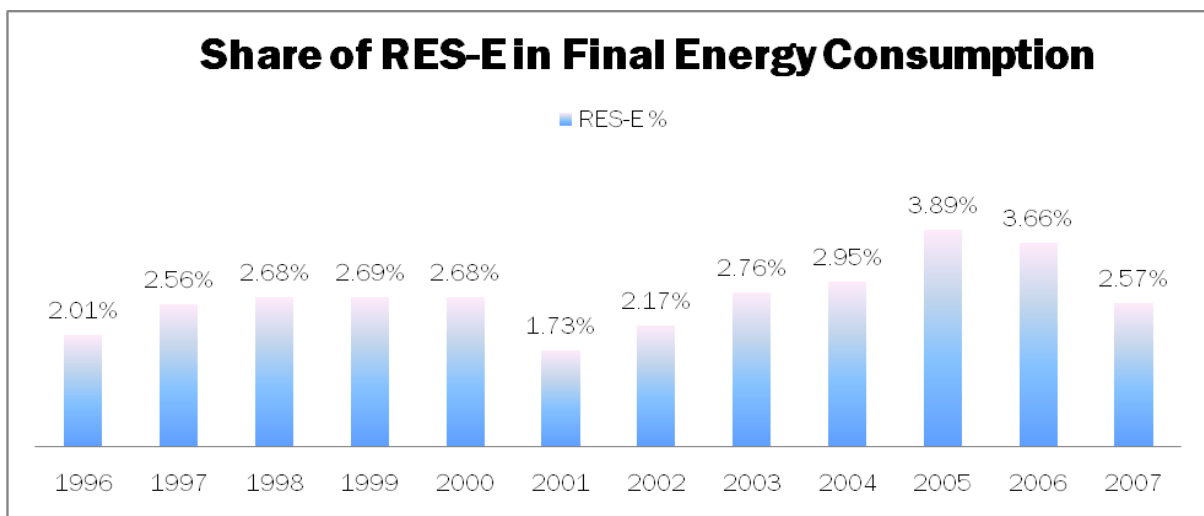


Figure 2. Electrical energy sector share in final energy consumption.

The main source of energy in the sector are hydro power stations, which in 2005 generated 373 KTOE. In 2007 the electrical energy generated by HPSs was 247 ktoe⁴, which equals approximately 98% of final electrical energy produced from renewable sources. Up to 2005 the share of wind, solar and geothermal plants, as well as of those using biomass, was

⁴ http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/main_tables - Renewable energy primary production: biomass, hydro, geothermal, wind and solar energy

negligible. It was not until the introduction of the feed-in tariffs for energy, produced from renewable energy sources that an increase in investor interest for wind and solar installations was observed.

According to data by the State Energy and Water Regulatory Commission (SEWRC)⁵, in 2008 the total capacity of operational wind power plants equalled 121 MW, and the produced electrical energy was 117 GWh.

For the same period, the total capacity of connected solar installations was 1.2 MW, and the produced electrical energy was 0.175 GWh.

Currently, Bulgarian legislation has no provisions for special mechanisms for supporting biogas production (e.g. feed-in tariffs, quotas, auxiliary mechanisms, tax concessions, subsidies, etc.) and, as a result, there are no installations built for its production and consumption for heating purposes.

2.2. Heat energy sector:

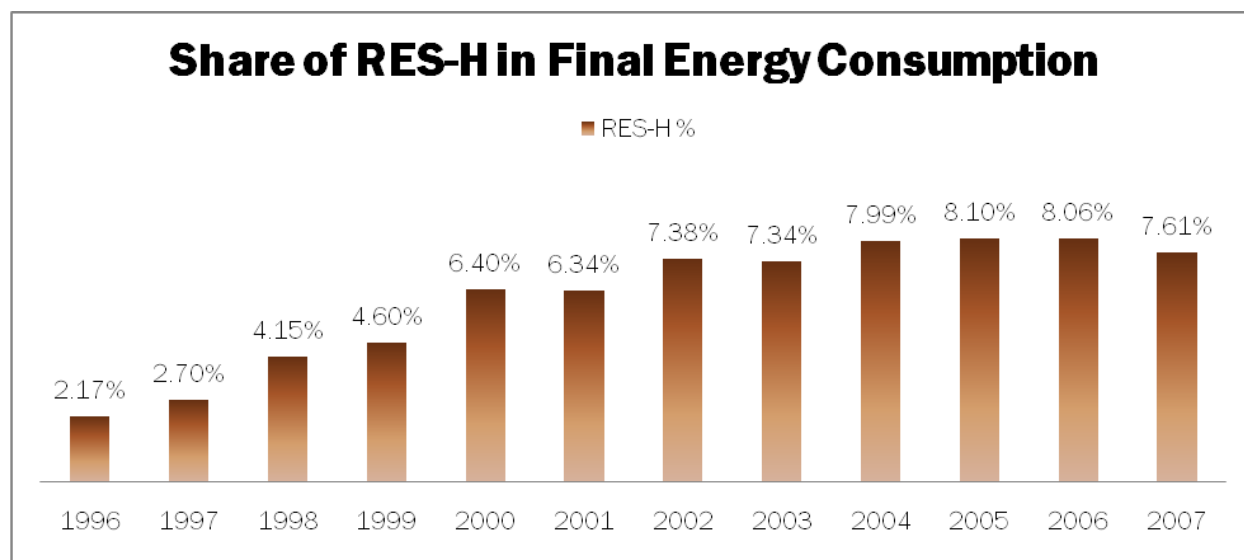


Figure 3. Heat energy sector share in final energy consumption

The heat energy sector has the largest share in the RES mix of the country due to the generated energy for heating purposes from biomass.

According to EUROSTAT data, 95% of the biomass for heating purposes is non-grid and is used for own consumption by individual plants and households. The low price of the raw

⁵ <http://www.dker.bg/certificates.htm>

material and the equipment are a prerequisite for the mass consumption of solid biomass in the sector⁶.

The production and use of briquettes and pellets, as well as the use of organic waste is less developed.⁷

⁶ National long-term programme for RES utilization promotion 2005-2015
<http://www.mi.government.bg/gzakon/gzakon/docs.html?Id=226288>

⁷ Ministry of economy and energy, national long-term programme for biomass utilization promotion for the period 2008-2020 г.
www.mtitec.government.bg/upload/docs/Biofuels_Program_final.pdf

2.3. Transport sector:

The biofuels share in the transport sector is rather small and is constantly below 1%.⁸

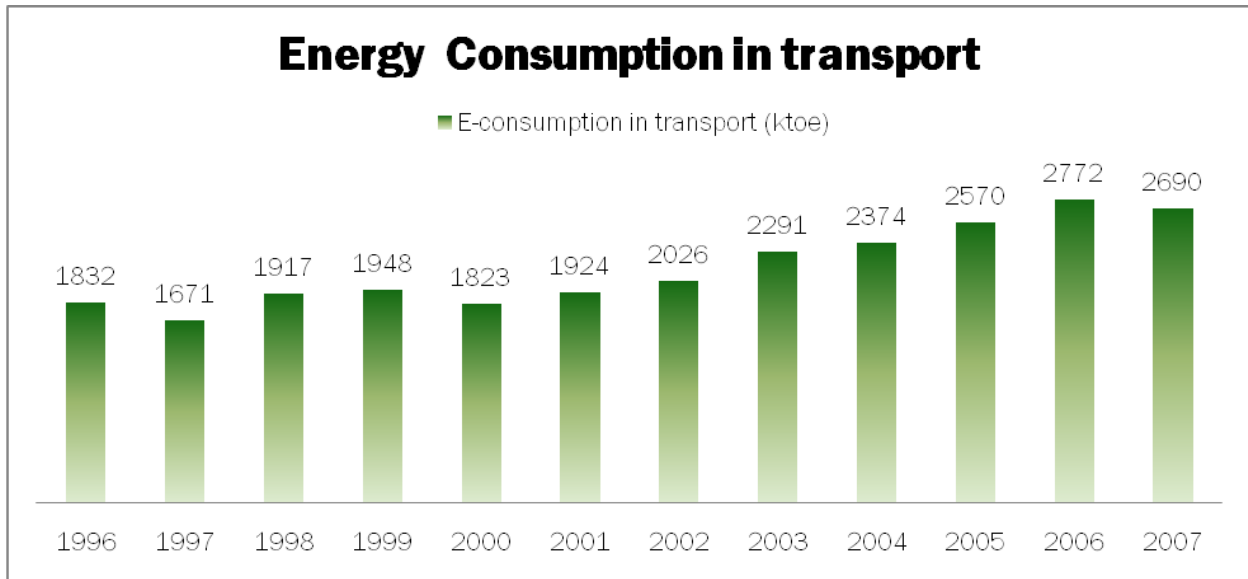


Figure 4. Final energy consumption in the transport sector

In view of the commitment of the Member States to achieve a 10% share of RES in transport, Bulgaria has to increase considerably the use of alternative energy sources in the sector. The short-term goal of the government is to require 2% content of biodiesel in the total consumption by March 2010 and its increase to 3% in 2011. A similar measure will be applied for bioethanol, whose content is planned to be 2% of the total consumption by 2011.

⁸ According to EUROSTAT data

3. Targets And Trajectories

3.1. Overall renewable energy targets and trajectories

RES goal for 2020 and Indicative trajectory	2005	Average	Average	Average	Average	2020
		2011-2012	2013-2014	2015-2016	2017-2018	
RES share in gross final energy consumption	9.40%	10.72%	11.38%	12.37%	13.69%	16%

Table. 2 Indicative trajectory and overall share of renewable energy in final energy consumption⁹

The deployment of energy from renewable sources is a priority for the EU. Their use contributes to limiting pollution, Green House Gas emissions, energy independence and sustainable development. Furthermore, besides contributing to security of supply and limiting emissions, the RES industry also creates new jobs.

As a Member of the European Union, Bulgaria undertakes its part in achieving the above targets. The national goal of our country, confirmed by Directive 2009/28/EC, is the achievement of at least 16% energy from renewable energy sources in gross final energy consumption by 2020. This requirement also includes covering the obligatory for all member countries 10% share of renewables in transport. The achievement of the aforementioned national targets for Bulgaria requires adequate policy for the promotion of production of energy from renewable and inexhaustible energy sources.

⁹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF>

3.2. The Energy Sector - Targets and trajectories

Bulgaria is heavily dependent on energy as it imports more than 70% of its primary energy sources. The only significant domestic energy source is low-quality lignite coal with high content of sulphur, some hydro potential and RES. Bulgaria is mainly reliant on energy sources from Russia: oil, natural gas, high-quality coal and nuclear fuel. This structure of the energy balance causes concern in terms of the security of energy supply. The European Union, whose dependence on imports is less (about 50%, but with a trend towards increasing this share up to 70% in 20 years' time), is making strenuous efforts in two key areas:

- Reduction in specific energy intensity per GDP unit in economy; and
- Utilisation of local renewable energy sources (RES).

The status of the energy mix in the country depends on various, directly or indirectly connected factors. Basically the influence on the consumption is exerted by the economic factors – economic growth and the level of the standard of living. Energy diversification is affected by the political situation and the energy strategy of the country, related to the observance of the European legislation and a number of conventions.¹⁰

3.2.1. Gross domestic product

Bulgaria's gross domestic product in 2007 was 56.5 billion BGN, and its real growth was slightly slowed to 6.2% (as compared to 6.3% in 2006). The macroeconomic situation is still expressed as a sustainable growth of over 5%¹¹. The global economic crisis in the following year affected Bulgaria, reduced the actual data and slowed down growth. The forecasts are for a gradual restoration and reaching the familiar growth levels in the next several years.

Bulgaria is the country with the lowest standard of living in the European Union. The goals set for the country require a more intensive development over the following years for it to reach the average values of the most important economic indicators of the community. Final energy consumption follows the economic growth of the country.

Assessment of the gross final electricity consumption made by the National Electric Company at the beginning of 2009, forecasted the following change¹²:

¹⁰ Report 2007-MEE

¹¹ http://www.mee.government.bg/energy/energy_doc/Energy_mix_2007.pdf

¹² <http://www.nek.bg/cgi?d=2129>

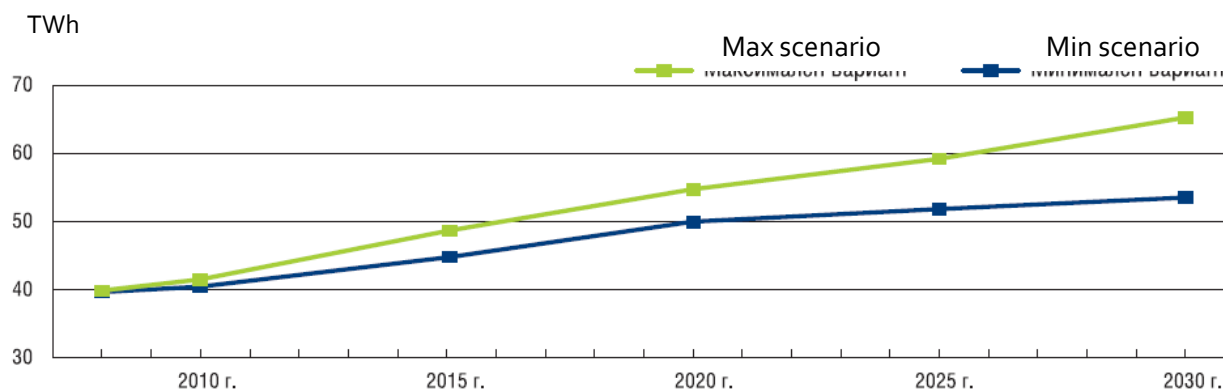


Figure 5. Forecast of the gross final electricity consumption, TWh¹³

3.2.2. Energy efficiency

There are certain obstacles to the realisation of energy efficiency projects in Bulgaria. The main barriers to the larger scale realisation of this type of projects are as follows:

- ✓ difficult access to financial resources;
- ✓ undertaking of considerable risk;
- ✓ insufficient capacity for elaboration of projects that are attractive for bank funding under the energy efficiency credit line;
- ✓ lack of innovatory funding of energy efficiency projects;
- ✓ poor financial incentives for the final energy user;
- ✓ poor or insufficient dissemination of information.

The efforts for overcoming these obstacles for now are limited mostly within the international financial support for Bulgaria for this type of projects, directed to the acquisition of experience in their funding on the part of the local financial institutions. (National Long-Term Energy Efficiency Programme until 2015)

¹³ Max scenario – electricity intensity reduced by 51%, min scenario - electricity intensity reduced by 41%

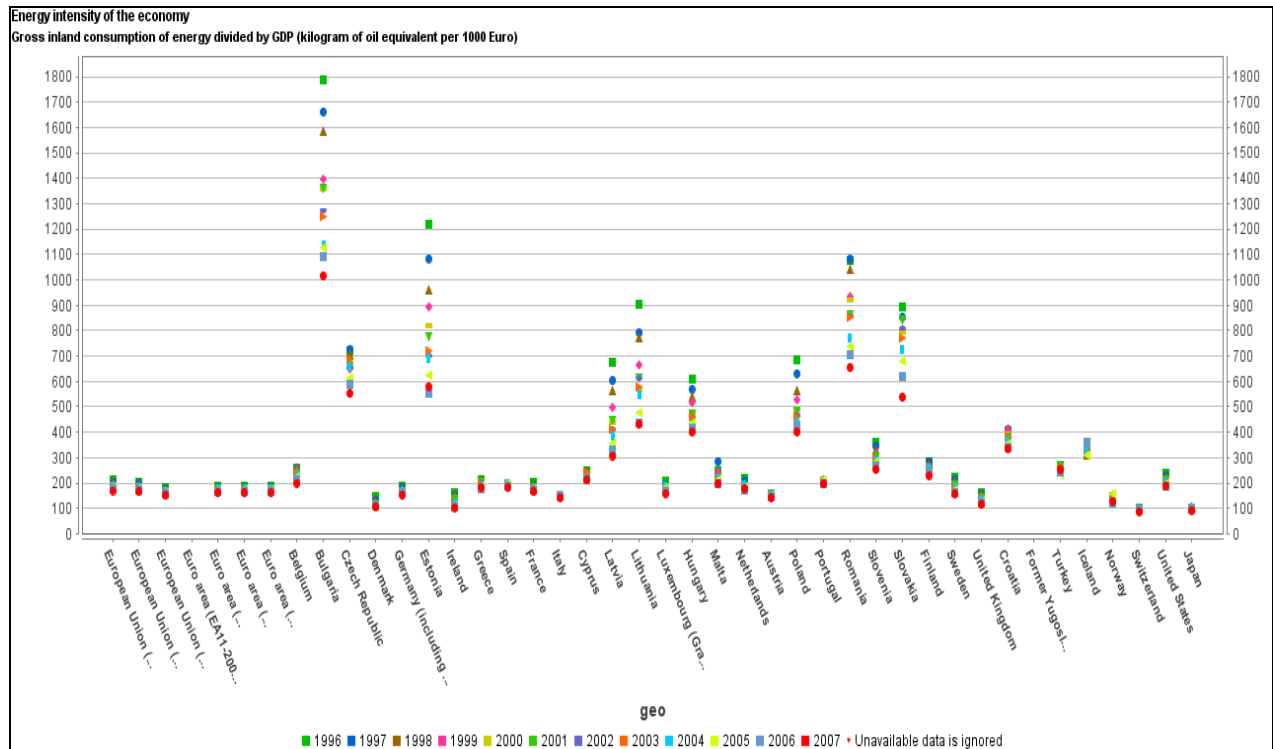


Figure 6. Energy intensity of the economy of Bulgaria

The energy efficiency in the country is several times lower than European average .¹⁴ Bulgaria will be approaching these levels relatively slowly and widespread implementation of energy efficiency measures will be less likely due to their higher cost

For instance, research by the Energy Efficiency Agency, which has been submitted to the managing authority of Operational programme "Regional development" at MRDPW, shows that the necessary investments for realisation of the energy efficiency measures in 668 buildings of educational establishments, valued at the time of research, are 157.1 M BGN¹⁵. Calculations show that the increased energy efficiency of a building requires 235,179 BGN on average.

The National programme for renovation of residential buildings¹⁶ from 2005, calculates in total 4,15 billion BGN required for rehabilitation and energy saving measure for the next 15 years.

With this measures not more than 35-40% energy saving is expected, and the main part of the funding is expected from the residents.

¹⁴ According to EUROSTAT data

¹⁵ <http://www.utilities.bg/show.php?storyid=859706>

¹⁶ <http://www.mee.government.bg/ind/inov/docs.html?id=205803>

The high price and expected relatively low efficiency will limit the implementation of the measures and will not contribute to the energy savings in total.

3.2.3. Legal framework

Plans for electric cars are currently scattered around EU Member States and the Spanish EU presidency officially wants the European Commission to prepare a plan for a common strategy by May 2010. According to it, the EU institutions will lead the large-scale implementation of electric vehicles.

Thus the efficiency of the renewable energy will be improved. The demand will be increased and a lot of capacity will become available for energy storage.

The idea is to integrate electric cars with a "smart" electricity network, which will charge vehicles only when there is an abundance of green power from sources such as wind farms.

Bulgaria could benefit from this situation, because of its natural advantages – short distances and scattered populated places. The country has big public vehicle park, which is over 10 years old that is supposed to be replaced with better and improved technology and thus, could be a pioneer in deployment of electric cars. The benefits will be for car owners (in this case, the public sector), environment, energy efficiency and economy.

Implementation of the above strategy will require applying financial mechanisms to facilitate the process by creating required infrastructure.

3.2.4 Term of operation of the existing power plants

The need for generator capacity in the system is defined by the development of the maximum load in the country and the necessary reserve capacity. In the following years, about 1,300 MW coal power plants will be decommissioned, which will affect the energy mix in the country.

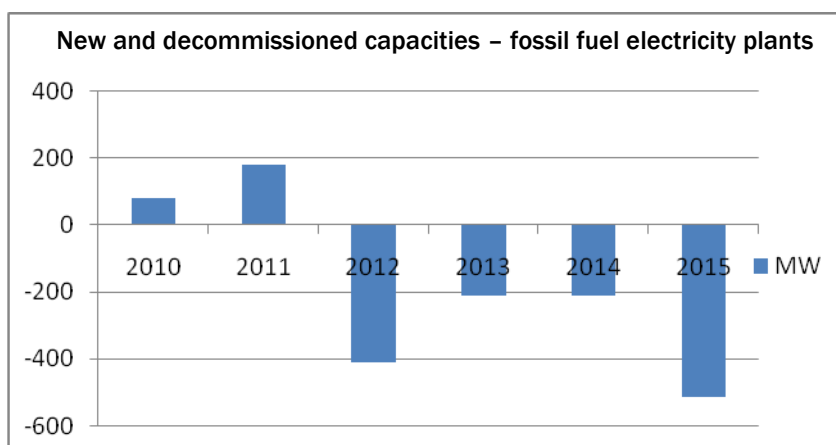


Figure 7. New and decommissioned capacities – fossil fuel electricity plants

3.2.5. CO₂ emissions, capture, transport and storage prices

Prices for **emissions**, carbon capture and storage technologies are another factor influencing the development of Bulgaria's energy mix.

Having in mind the requirements of the Kyoto protocol for reduction of Greenhouse gas emissions and the advent of an emissions trading scheme among EU Member States, conventional power generation capacities will become less and less affordable. As the availability of quotas for CO₂ emissions gradually decrease, their price will go up and this will translate into higher production costs. Conventional power plant operators will have to either find a solution to store their excess emissions or improve their production cycles to limit the exhaust. Therefore, the cost for carbon capture and storage technologies will have to be included as factor in determining the possible change in the country's energy mix including the development of renewables.

For instance, the total public and private investment needed in Europe for carbon capture and storage technologies over the next 10 years is estimated to €13 bn. The target is to reduce the cost of CCS to 30-50 € per tonne of CO₂ abated by 2020, making it cost-effective within a carbon pricing environment.¹⁷

The EU Commission has assumed In 2009 prices for **CO₂ emissions** at about 40 Euro price per tonne of CO₂ allowances while the current market price is EUR 15 per tonne.

3.2.6. Transmission grid

The transmission grids have to respond to three interrelated challenges – creating a real internal market; integrating a massive increase of recurrent energy sources; and managing complex interactions between suppliers and customers.

The objective of the European Industrial Initiative on electricity grid is to enable the transmission and distribution of up to 35% of electricity from dispersed and concentrated renewable sources by 2020 and a completely decarbonised electricity production by 2050; to integrate further national grids into a market-based genuine pan-European grid, to guarantee a high quality of electricity supply to all customers and to engage them as active participants in energy efficiency; and to anticipate new developments such as the electrification of transport.

For Bulgaria, such a development in the following years is an expensive and difficult to achieve undertaking. In order to comply with the provisions for RES by 2020 and beyond, it is necessary to perform a timely preparation of the electricity transmission grid. Active

¹⁷ Investing in the Development of Low Carbon Technologies (SET-Plan) EK, Brussels, 7.10.2009

participation in this direction is expected not only from the grid owners, but also from all interested parties – industry, business, NGOs, and consumers. It is necessary to start the respective discussions, analyses and research of the necessary capacity and development in time. An example for that is the proposed project to 7th framework programme of EU for research and evaluation of the electrical transmission network capacity in Bulgaria. Representatives of all stakeholders participate in the consortium, as well as participants from the countries with most developed network and RES share.

3.2.7. Transport

Road transport has the strongest influence on the energy consumption of the transport sector. It consumes about 90% of the overall energy consumption in transport.

Road transport consumes exclusively oil-based products, whereas railway transport is much more energy efficient. In the latter half of the consumption is of electrical energy (for 2007 – 56%). Meanwhile, road transport is indispensable in many cases, as the railway network, inland waterways or coastal shipping cannot cover all necessary destinations for the transported cargoes.

In view of these facts, as well as of the expected increase in cargo transportation in the period 2000-2020 with about 50%, it is necessary to increase the energy efficiency and the use of alternative fuels in transport. In this connection the policy of the Ministry of transport with regard to energy efficiency in transport is focused on:

- ✓ Transport infrastructure improvement
- ✓ Transport fleet renovation
- ✓ Improvement of the organisation and extending the scope of intermodal transportation
- ✓ Stimulating the increase in the share of the energy efficient modes of transportation (railway, inland waterway and sea transport)
- ✓ Stimulating the use of public transport
- ✓ Improving the traffic organisation and regulation in the populated areas
- ✓ Stimulating the use of biofuels
- ✓ Improving drivers' professional skills

The European Union also stimulates the increase in the share of the energy efficient modes of transportation (railway, inland waterway and sea transport), the use of public transport, and the improvement of traffic organisation regulation in populated areas.

The development of bicycle transport is one of the measures to achieve "sustainable urban mobility", in the context of the Green paper "Towards a new culture for urban mobility" of the European Commission, drafted in 2007.

The aforementioned plans, as well as the antiquated vehicle fleet at the present moment establish a sustainable tendency towards a reduction of the consumption of fuels in the transport sector.

In compliance with the RAESBA regulations, a National long-term programme for biofuel consumption in the transport sector 2008-2020 was adopted. The programme defines the national indicative goals for biofuel use promotion in the country for the period 2008-2020.

The following national goals for biofuel consumption in the transport sector have been defined:

- **2008** – 2.00 %;
- **2009** – 3.50 %;
- **2010** – 5.75 %;
- **2015** – 8.00 %;
- **2020** – 10.00 %.

In the event of failure to achieve the biofuel goals above, the percentage share of renewable energy sources in transport in compliance with Directive 2009/28/EC may be complemented with electrical energy from renewable sources. This is especially current at the moment with the preparation of an EU strategy for an increase in electromobility.

According to the above assumptions, the

3.2.8. Development of energy needs by 2020 will change as following:

- **Electricity sector**

According to the industry forecast, the consumption of electricity will increase by 3% annually. The share of renewables in the sector will increase remarkably and will contribute to the fulfilment of the obligations for the other sectors.

- **Heating sector**

According to the industry forecast, the demand for space heating and cooling will increase with 2% annually. The share of renewables in the sector will be close to constant with small decrease at the end of the period.

- **Transport sector**

According to the industry forecast, the energy consumed in transport will decrease with 5% annually. Despite this, there will be some troubles with fulfillment of the obligatory 10% RES. Some support would be expected from electricity generated by RES, but a lot of biofuels are supposed to be imported as well.

The forecast values for the RES share by sectors - produced electrical energy, heat energy and biofuels, are presented in Table 9:

KTOE	Average 2011-2012	Average 2013-2014	Average 2015-2016	Average 2017-2018	2020
Expected Gross Final energy consumption	11095	11282	11514	11790	12195
Gross Final Consumption of electricity from RES	506	635	825	1132	1476
Share of RES electricity in gross final electricity consumption	14.05%	16.64%	20.36%	26.35%	31.90%
Gross final energy consumption from RES in heating and cooling	757	764	767	761	736
Share of RES heating and cooling in final heating and cooling consumption	15.59%	15.12%	14.59%	13.92%	12.80%
Final energy from renewable sources consumed in transport	148	155	160	163	159
Imported biofuels	116	96	59	62	78
Share of RES in transport	6%	7%	8%	9%	10%
Total share of RES in final energy consumption	12.72%	13.77%	15.22%	17.44%	19.44%

Table 3: Targets for 2020 and indicative trajectory for the share of energy from renewable sources in the electricity, heating and cooling and transport sectors in Ktoe.

3.3. Contribution of renewables to electricity consumption

Contribution expected of each technology to meet the binding 2020 target and the indicative trajectory for the share of RES in electricity (in terms of installed capacity and gross electricity generation).

	2005		Average		Average		Average		Average		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Biomass	0	0	16	83	53	293	109	590	122	661	143	754
Biogas	0	0	2	12	23	142	40	252	46	289	39	244
Solid (and liquid)	0	0	14	65	29	138	65	313	72	346	100	482
Biodegradable part of MSW			1	5	2	12	4	25	4	26	4	28
Concentrated solar power	0	0	0	0	0	0	0	0	0	0	0	0
Geothermal	0	0	0	0	0	0	0	0	0	0	0	0
Hydro, total (w/o pumps))	2650	4337	2935	3229	3023	3352	3072	3550	3316	3708	3326	3588
Small hydro (<10MW)	0	0	205	527	271	628	320	826	390	957	400	982
Large hydro (>10MW)	2650	4337	2730	2702	2752	2724	2752	2724	2926	2751	2926	2606
Photovoltaics	0	0	17	20.4	100	120	550	660	1100	1320	1500	1800
Ocean	0	0	0	0	0	0	0	0	0	0	0	0
Wind	11	25	1120	2551	1592	3626	2105	4794	3284	7480	4840	11024
In the country	11	25	1120	2551	1592	3626	2105	4794	2784	6341	3940	8974
Offshore	0	0	0	0	0	0	0	0	500	1139	900	2050
Total RES-E	2661	4362	4088	5883	4768	7391	5836	9594	7822	13169	9809	17165
Gross electrical energy consumption		36394		41860		44410		47114		49983		53811
RES-E share in the gross final electrical energy consumption		11.99%		14.05%		16.64%		20.36%		26.35%		31.90%

Table 4. Contribution of renewable technology to electricity consumption¹⁸

¹⁸ The presented results are based on conducted surveys of the theoretical and technological potential of the different RES, as compared to the forecasts for a change in the regulations and the forecasts for a change in the prices of the technology

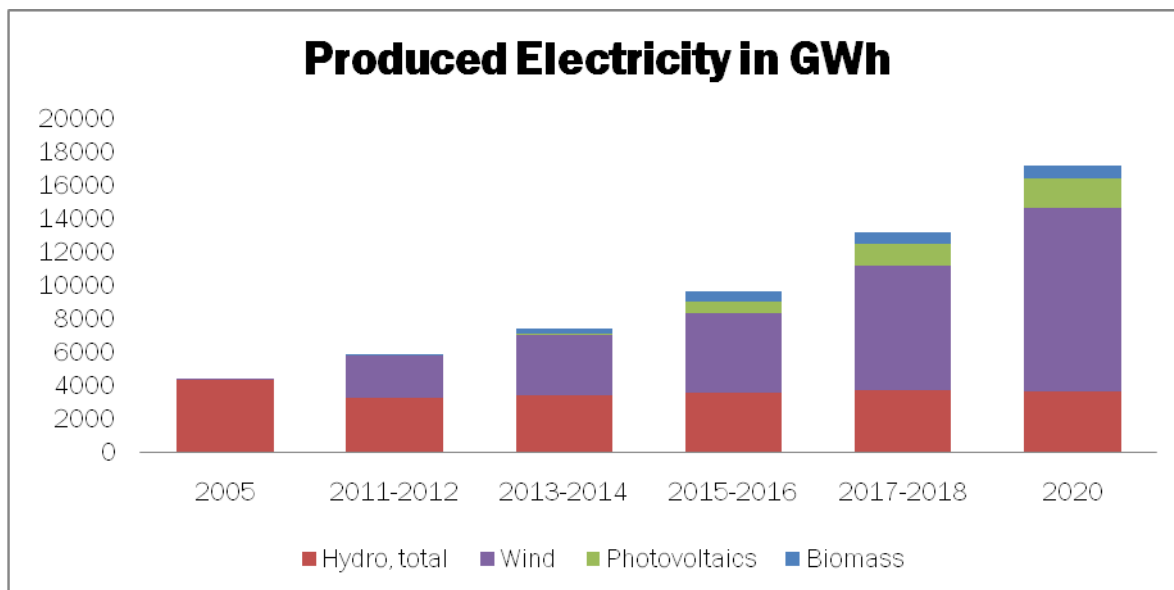


Figure 8. Contribution of renewables to electricity consumption, GWh

3.3.1. Development of the different branches

- **Bioenergy**

The European Industrial Initiative on Bioenergy addresses the technical and economic barriers to the further development and accelerated commercial deployment of bioenergy technologies for widespread sustainable exploitation of biomass resources, aiming to ensure at least 14% bioenergy in the EU energy mix by 2020, and at the same time to guarantee greenhouse gas (GHG) emission savings of 60% for bio-fuels and bio-liquids under the sustainability criteria of the new RES Directive.

Indicative Key Performance Indicators (KPIs) for electricity generation, according to the Technology Roadmap, an EU commission staff working document:

- Investment cost < 1500 €/kWh by 2015-2020
- Electricity production cost < 0.05 €/kWh by 2015-2020

- **Solid biomass**

The insufficient amount concentration of the resource, predominantly difficult terrain conditions, lack of sufficiently developed infrastructure, and suitable technologies for utilisation determine a lower technological potential and respective share in the overall mix.

The basic criteria for biomass profitability and increasing the used potential are the transport costs and collection and processing costs. The higher these costs, the lower the production profitability.

The evaluation of the resource of agricultural biomass should take into account that the constructed utilisation technologies are few. The main obstacle to the wide-scale use of biomass for energy purposes is the lack of financial resources for constructing processing and utilisation facilities. Although calculations show annual return on investment of 35-50%, there are no suitable funding schemes. Presently, about 20-25% of agricultural biomass potential can be actually realised.

- **Biowaste**

Bulgaria has a good infrastructure and an adequate waste management framework. The system for separate waste collection and recycling in Bulgaria still does not function well enough and a large part of the biodegradable waste goes into the landfills. About 85% of the generated waste is transported to the depots, and approximately 52% of the total amount of waste is biodegradable.

The sites for depositing waste, as well as the farms in Bulgaria are sufficient and adequate for locating biogas production plants. This is a prerequisite both for the biogas market and for the secondary bioproduct market (compost and liquid organic manure). It is recommended that the facilities for biogas production are located immediately next to the landfills or in the very industrial or agricultural workshops, and thus reduced the transport costs. Non-centralized biogas installations are favoured more, as they can be adjusted to specific sites and raw materials, and the transport costs can be reduced to minimum.

The interest in biogas production from organic waste has been increasing over the last years. Currently, in Bulgaria there are no feed-in tariffs for support of electricity production from biogas. There is only one operational biogas power plant producing electricity with capacity 450 kW. The biogas potential of Bulgaria is big, but the investment cost for development of large capacity plants is still too high and we do not expect a significant increase in the total number of installed capacities.

Currently, the potential raw materials for biogas production are used inadequately (incorrectly processed or deposited, that in return leads to higher risk of ecological pollutions). The processing of manure with the help of anaerobic decomposition does not only reduce the amount of released emissions, but also improves the properties of the obtained secondary biomass. In addition, the technologies for biogas production could be an effective means for reducing the country's energy dependence.

As at present, there are 52 urban waste water treatment plants constructed in the country, of which 13 treat water only mechanically, and 39 have biological treatment facilities. The urban waste water treatment plants operate in 47 towns and cities and serve 35.3% of the country's population. The treatment of the precipitate at UWWTP can produce biogas that may be utilised for energy purposes.

- **Geothermal energy**

Bulgarian geothermal potential for power generation has been estimated to 200 MWe by the Geothermal Energy Association disclosed in EBRD, Bulgaria profile¹⁹. In order to utilize this potential for power generation, the necessary temperature of the available reservoirs is supposed to be high enough. According to the information disclosed by EBRD and a survey conducted by the Bulgarian Academy of Science, the majority of geothermal sources on the territory of the country are with temperature between 20°C -30°C and 40°C - 60°C²⁰. Therefore, the geothermal potential of Bulgaria for electrical power generation is insufficient.

- **Hydro power**

Bulgaria is one of the poorest countries in water resources in Europe. The average annual amount of water is approximately 2,300 – 2,400 m³ per person, and the usable part of it is from 800 to 1,000 m³. In the future it is expected that water deficit will increase, which will become a very serious social, economic and ecological problem for the country. The size and nature of the very reduction continues to be a debatable issue, but a drought of about 10% can be presumed conditionally.²¹

Hydro Power Plants (HPPs) change the water regime of rivers and affect the normal functioning of ecosystems and biodiversity. Bulgaria is a party to a number of Conventions and is obliged to follow Directives orientated towards biodiversity preservation and restoration. The compliance with these normative documents will limit the possibilities for constructing new HPPs, and will also additionally reduce the minimum run-off and lead to change of the HPP performance and their production diminution.

According to Mr. M. Papazian, an Executive Director of the National Electric Company until 2010, the annual costs for rehabilitation of 3506 MW Hydro Power Plants property of the NEC have been estimated to 100-150 million BGN.

Simple calculations show that average annual amount of money spent per MW per year is about BGN 28-42 mln. For instance, a MW installed capacity of wind turbines costs approximately EUR 1,2-1,5 mln.

- **Photovoltaics**

The European Industrial Initiative on solar energy focuses on photovoltaics (PV). The objective of the PV component of the Initiative is to improve the competitiveness of the

¹⁹ EBRD Bulgaria Profile @ <http://ebrdrenewables.com/sites/renew/countries/bulgaria/profile.aspx>

²⁰ EBRD Bulgaria Profile @ <http://ebrdrenewables.com/sites/renew/countries/bulgaria/profile.aspx>

²¹ Article Energoproekt E&E.

technology and to facilitate its large scale penetration in urban areas and green field locations, as well as its integration into the electricity grid. These measures should establish PV as a competitive and sustainable energy technology contributing up to 12% of European electricity demand by 2020.

Achieving this objective for photovoltaic energy requires a substantial reduction of costs, the improvement of device efficiencies, and at the same time, the demonstration of innovative technological solutions for large scale deployment of PV – both building-integrated and stand alone systems.

Indicative Key Performance Indicators for electricity generation, according to the Technology Roadmap, an EU commission staff working document:

- Reduced conventional turnkey PV system cost to <1.5€/Wp by 2020
- Reduced concentrated PV system cost to <2€/Wp by 2020
- Increased PV (module) conversion efficiency to > 23% by 2020 / concentrated PV conversion efficiency > 35% by 2020
- Increased crystalline silicon and thin film modules lifetime to 40 years

Bulgaria has a serious theoretical potential for production of solar electrical energy. The potential for utilisation by domestic users is enormous. This is especially valid under the currently decreasing prices of the equipment and the increase in the price of domestic electrical energy.

- **Wind power**

European Industrial Initiative aims to improve the competitiveness of wind energy technologies, to enable the exploitation of the offshore resources and deep waters potential, and to facilitate grid integration of the wind power; to enable wind energy to take a 20% share of the final EU electricity consumption by 2020.

Achieving this objective for wind energy requires an additional 20% reduction of manufacturing costs of wind turbines and their components, transport, erection and installation costs by 2020. Additional condition is less than 3% uncertainty of wind resources and conditions predictions.

Recently, wind energy technology offers the lowest price per installed capacity among all RES technologies. The technological capacities of the new generation wind generators are increasing and will allow effective operation even with weak winds.

The huge interest of investors, large number of already launched projects; adequate normative conditions and great wind resource determine the forecasts for an intensive increase in installed capacities by 2020.

In addition to the already strong support for onshore projects, the EU policies are also looking forward to locating wind facilities also off-shore territories. Currently, there are no

applications for installations of wind generators in the Black Sea, but there is growing interest and the commissioning of the first large wind parks is expected before 2020.

3.4. Contribution of Renewables to the Heating and Cooling Consumption

Contribution expected of each technology to meet the binding 2020 target and the indicative trajectory for the share of RES in heating and cooling (in terms of installed capacity and final heating and cooling consumption).

	2005		Average		Average		Average		Average		2020	
	MW	ktoe	MW	ktoe	MW	ktoe	MW	ktoe	MW	ktoe	MW	ktoe
Biomass		743	5386	731	5297	726	5333	711	5132	692	4894	661
Biogas	0	0	0	0	54	5	95	9	109	11	92	9
Solid (and liquid)	5480	743	5384	730	5311	720	5163	700	5015	680	4794	650
Biodegradable part of MSW	0	0	1	0	3	1	7	1	7	2	8	2
Geothermal	0	10	54	12	68	15	114	25	132	29	137	30
Solar thermal	0	0	278	13	531	20	716	27	929	35	1062	40
Heat pumps	0	0	4	1	23	3	31	4	39	5	39	5
RES in heating and cooling energy, total	0	753	5722	757	5919	764	6194	767	6232	761	6132	736
Gross final heating and cooling demand		4318		4855		5052		5256		5468		5745
RES-E share in gross final heating and cooling consumption		17.44 %		15.59 %		15.12 %		14.59 %		13.92 %		12.80 %

Table 5. Contribution of renewables technology to heating and cooling²²

²² The presented results are based on conducted surveys of the theoretical and technological potential of the different RES, as compared to the forecasts for a change in the regulations and the forecasts for a change in the prices of the technology

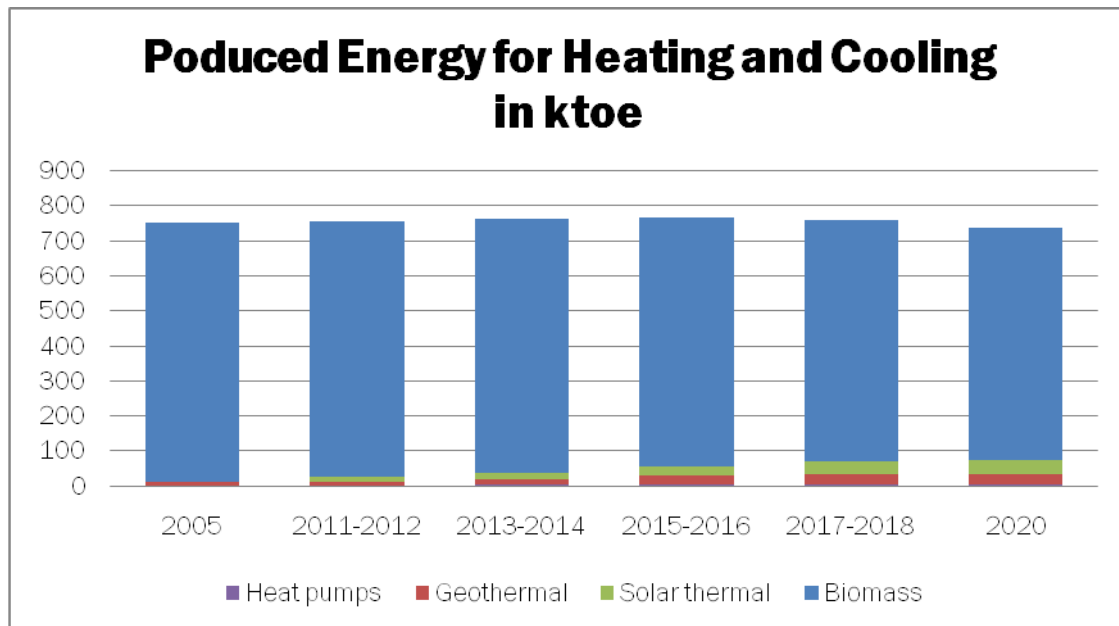


Figure 9. Contribution of renewables to heating and cooling, ktoe

- **Bioenergy**

In 2020, bioenergy will continue to make the largest contribution to total heat supply from renewable energies.

Solid biogenic fuels will dominate bio-energy heat production as a whole. The rapid rise in pellet heating systems will make an even larger contribution in homes. According to the forecast, the use of wood pellets for heat production will increase significantly.

Indicative Key Performance Indicators (KPIs) for electricity generation, according to the Technology Roadmap of the EU commission:

- Biofuel production cost < 0.6 € /litre gasoline equivalent
- Capital investment and operation costs in line with fossil industry refinery costs

According to the prognosis for improving the economy and personal standart, it is forecasted that the biomass consumption for heating will gradually decrease and will switch to electricity climatic systems; thus increasing the electricity consumption with corresponding quantities.

- **Geothermal Energy**

The forecast assumes a constant increase in heat generation from geothermal energy in the next ten years. Preliminary studies estimate that Bulgaria's overall potential for

geothermal energy is still underdeveloped. The approximated overall potential of the country is in the range 440MWt -1800MWt of thermal energy (International Geothermal Association, 2002)²³. Currently, the dominant use of geothermal energy is for treatment and rehabilitation purposes in numerous locations balneology centers around the country, and to lesser extent for space heating, greenhouses and industrial purposes. The utilization of geothermal energy has been approximated close to 37%, or 1761 TJ per annum (IGA, 2004).

- **Solar Thermal Energy**

The area of solar collectors installed in Bulgaria will increase significantly in next ten years. The potential to its large scale penetration in urban areas is vast.

According to report made under the project EAST-GSR, the theoretical potential Solar thermal energy in Bulgaria is 13×10^6 ktoe/ year, the technically feasible potential is assessed as 246 ktoe/ year for domestic hot water.

Achieving this objective for solar thermal energy requires a substantial reduction of costs and improvement of device efficiencies. Fortunately, this scenario is foreseen by many analyses of the market.

Despite all, at present in Bulgaria there are installed solar thermal installations with total surface of 56×10^3 and total installed capacity of 42 MW²⁴. A huge number of projects for solar installation for domestic hot water are realized in hotel complexes and private homes in Black sea and mountain regions.

Working out short-term programs has to be detailed with priority, taking into account the possibilities for installation of solar thermal systems in the areas with high population density and high value of radiation potential. Very suitable and economically effective will be multi – family buildings in sunny regions. These systems can be viewed, as a supplement to central district heating systems in big cities, which will supply the subscribers with hot water during sunny months, when the costs of the hot water, carried by the systems of central heating is relatively high.

²³ EBRD Bulgaria Profile @ <http://ebrdrenewables.com/sites/renew/countries/bulgaria/profile.aspx>

²⁴ EAST-GSR

3.5. Contribution of renewables to transport fuel consumption

Contribution expected of each technology to meet the binding 2020 target and the indicative inter-rim trajectory for the share of energy from RES in the transport sector.

Consumption in Ktoe	2005	Average 2011-2012	Average 2013-2014	Average 2015-2016	Average 2017-2018	2020
Biofuels	0	148	155	160	163	159
of which imported	0	116	96	59	62	78
Final energy from renewable sources consumed in transport	0	148	155	160	163	159

Table 6. Biofuels consumption by 2020

The importance of electricity from renewable sources in the transport sector will increase drastically. The forecast anticipates a rise in the importance of rail transport and the use of electric vehicles.

Substantial impact on the energy mix in the transport will appear from the near future common strategies of the European Commission on electric cars and emissions.

In Bulgaria, for the purposes of achieving the obligatory goal of 10% biofuels in 2020, the necessary areas sown with energy crops must total 16.3% of the arable lands. This is less likely and would be at the expense of the food and tobacco industries.

Research of the biofuel potential for transport in Bulgaria was conducted under a project by Altener Bio-East. According to the project results, bioethanol production will be realised from grain crops (maize or wheat) or from sugar beet (with higher yield). The production of biodiesel will be from sunflower and rapeseed.

The potential of the biodiesel production facilities exceeds the raw material potential of agriculture. Currently, the capacity for biodiesel production is about 402,000 t / year, and for bioethanol – 66,500 t / year. The forecast for biofuel production under the current conditions for supporting the sector is that the necessary 10% of energy in transport will not be achieved.

The technically achievable potential of biofuels in Bulgaria, studied by order of MEE, is heavily restrained to levels several times lower than the necessary 10%. Achieving the goal in transport may be accomplished by import of biofuels or compensation through electrical energy from RES.

4. Measures for achieving the targets

4.1. National and regional legislation concerning authorisation, certification, licensing procedures and spatial planning.

There are numerous legal acts and ordinances related to the permitting procedure as whole. Just a few of them were created especially for renewable energy sources and this is one of the most significant problems of the development processes. Most of the regulations are not applicable for RES and this is causing a lot of problems for the investors.

- *Renewable and Alternative Energy Sources and Biofuels Act*
- *Energy Act*
- *Encouragement of Investment Act*
- *Law for protection of the environment*
- *Law of the spatial planning*
- *Law for the roads*
- *Law for the waters*
- *Law of energy efficiency*
- *Ordinance №16-27 of 22.01.2008 for the conditions of implementation of the evaluation for the current and future potential of the resources to produce energy from Renewable and Alternative Energy Sources*
- *Ordinance №16-2 of 22.01.2008 for the content, conditions and methodology of the provision of information for the produced, purchased and sold quantities of energy from Renewable and Alternative Energy Sources and the produced, purchased and sold quantities of Biofuels*
- *Ordinance for operations and license of power engineering industry*
- *Ordinance of access and interconnection of producers and customers of electrical energy to the power grid.*

- Ordinance № RD-16-1057 of December 10, 2009 on the terms and procedures of energy efficiency [audit /investigation](#) and certification of buildings, issuance of energy performance certificates and certificate categories
- Ordinance № RD-16-1058 of December 10, 2009 on the energy consumption indicators and the energy performance of buildings
- Ordinance № 6 of June 9, 2004 on the connection of producers and consumers of electricity to the transmission and distribution grids
- Ordinance № 7 of 2004 on energy efficiency, heat conservation and energy saving in buildings (Title amended, SG No. 85/2009)
- Ordinance № 8 of June 9, 2004 on the terms and procedures regulating the activities carried out by the operators of the electricity system and distribution grids, by the on-duty operations staff of power generation facilities and the electrical installations of consumers issued by the Ministry of Energy and Energy Resources
- Ordinance № 9 of June 9, 2004 on the technical operation of electric power plants and grids issued by the Ministry of Energy and Energy Resources
- Ordinance № 16 - 27 of January 22, 2008 on the terms and procedures of carrying out an assessment of availability and estimated potential of the resources for power generation from renewable and/or alternative energy sources
- Ordinance № 16 of June 9, 2004 on the servitudes of energy projects
- Ordinance № RD-16-267 of March 19, 2008 on determining the amount of electricity from cogeneration ([CHP](#))
- Ordinance № RD -16-346 of April 2, 2009 on the energy consumption indicators, energy performance of industrial systems, terms and procedures of energy efficiency [audit /investigation](#) of industrial systems
- Ordinance № RD-16-347 of April 2, 2009 on the terms and procedures of determining the amount and payment of the projected funds under guaranteed energy savings performance contracts for state and municipal buildings
- Ordinance № RD-16-348 of April 2, 2009 on the circumstances subject to entry into the register of persons implementing certification of buildings and energy efficiency [audit/investigation](#), and on receiving information from the register
- Ordinance № RD-16-932 of October 23, 2009 on the terms and procedures of carrying out energy efficiency inspections of the hot-water boilers and air-conditioning systems under art. 27, para. 1 and art. 28, para. 1 of the Energy Efficiency Act and creating, maintaining and using the database issued by the Ministry of economy, energy and tourism for them
- Ordinance № RD-16-996 of October 31, 2007 on the content, structure, terms and procedures for submission of information from the enterprises engaged in energy resource extraction, processing and trade in fuels, conversion, transmission, distribution and trade in energy and natural gas, for the purposes of energy planning and forecasting
- Ordinance on the issuance of certificates of origin of electricity generated from renewable energy sources
- Ordinance on the issuance of certificates of origin of electricity generated by cogeneration (Title amended, SG No. 10 / 2009)
- Ordinance on licensing of activities in the energy sector
- Ordinance on formation and application of electricity prices and tariffs
- Ordinance on regulation of the electricity price

- Ordinance on the terms and procedure for access of eligible customers and independent producers to the electricity transmission and distribution [grids/systems](#)
- Ordinance on the terms and procedure for carrying out environmental assessment of plans and programs (Title amended, SG No. 3 / 2006)
- Ordinance on the terms and procedure for carrying out compatibility assessment of plans, programs, projects and investment proposals with the protected area conservation targets and objectives
- Ordinance on the terms and procedure for carrying out environmental impact assessment (Title amended, SG No. 3 / 2006)
- *Rules for trading of electrical energy*
- *Rules for managing the electrical power system*
- *Rules for measuring the quantity of electrical power*
- *Rules of conditions and order of access to transmission and distribution grid*

Responsible Ministries / authorities and their competences in the field:

The investment process is mainly subordinated to the following Ministries:

1. Ministry of Environment and Waters

1.1. Regional inspection for environment and waters. These authorities are responsible for Environment Impact assessment.

2. Ministry of Health

2.1. Regional inspectorate RIOKOZ – These authorities are responsible for part of procedure related with EIA

3. Ministry of Defence

4. Ministry of Transport, Information technology and Communications

5. Ministry of Agriculture and Food

5.1. Regional Directorate for agriculture and forests. These authorities are mainly responsible for the procedure of “rededication of the land”.

6. Ministry of Regional development and Public work.

6.1. On local level Municipalities represented by the Chief architect put in to practice regulations required by the Ministry as adopting of the all technical design on accordance with the Law of spatial planning.

7. Ministry of Economy, Energy and Tourism

8. State Energy and Water Regulatory Commission – stipulates feed-in-tariffs, issues licenses of producers of energy and certificates of origin.

Reform foreseen by:

- Not later than December, 5th 2010 a new Renewable and Alternative Energy Sources and Biofuels Act will be adopted.

Specific measures at regional / local levels (where relevant):

- The lack of satisfying legal base and contradictory legislations lead to a lot of different procedures at local level. The permitting procedures are very often different among different municipalities in spite of the common legal act that local authorities should follow.

Which level of administration (local, regional and national) is responsible for authorisation, certification and licensing of renewable energy installations and for spatial planning? (If it depends on the type of installation, please specify.) If more than one level is involved, how is the coordination between the different levels managed? How will the coordination between different responsible authorities be improved in the future?

- The authority responsible for certification and licensing of renewable energy installations is called "Directorate for national construction supervision".
- This directorate is subordinate to Ministry of Regional development and Public work and observes execution of Law of spatial planning.
- There are two levels of subordination:
 - *on a governmental level - "Directorate for national construction supervision" and
 - *on a local level "Regional directorate for national construction supervision".
- All required papers for having certification of renewable energy installations (called "Permission of use") should be addressed to "Directorate for national construction supervision" and then, after observation of all papers, directorate forward all papers to the regional division for convene of inspection (art 177 (2) "The constructions of first, second and third category shall be entered into exploitation only on the basis of permission for use, issued by the bodies of the Directorate for national construction control, under the conditions and by the order of, determined in an ordinance by the Minister of Regional Development and Public Works").
- Local division inspects and then forwards to the Directorate a protocol for the results. On the ground of this protocol the Directorate issues the Permission of use.

Is the renewable energy potential taken into account in spatial planning? If certain areas are preferred for the use of renewable energy sources, where is information on this publicly available?

- A lot of studies suggest that the wind power potential of Bulgaria is limited. It is estimated that an overall area of about 1'400 km² has average annual wind speeds of more than 6,5 m/s on the basis of measurement made 10 m above ground.
- The big obstacles for wind energy developers in Bulgaria is the lack of good and reliable wind data. The existing data are from Bulgarian meteorological station but they are not suitable for real wind data correlation and analysis.
- Between 2005 and 2008, the developers start to use their own measurement as a source of more reliable wind data. There are also a companies and joint projects that are focused on creating a "Bulgarian wind potential map"

How many process steps are needed to receive the final authorisation/ licence/permit? How is the horizontal coordination facilitated between different administrative bodies, responsible for the different parts of the permit? Is there a one-stop shop for coordinating all steps to be completed? Are timetables for processing applications communicated in advance?

- There is no horizontal communication and subordination between the authorities.
- This is the list of needed permits for one wind power plant to be put into operation. The usual development period is between two and three years. In different municipalities the needed time is different because of different procedures and approaches.
- There is one possibility for facilitation of the process. Every project that is certified as "class A investments" obtains an individual administrative servicing. But this procedure is possible only for investments above 32 000 000.00. leva

Notification for investment intention
Statement for technical requirements and possibilities for having grid connection
Permission for starting with the preparation of "Detailed urban plan"
Environmental impact assessment (permit from Environmental Agency)
Hygiene statement from the "RIOKOZ"
Health impact assessment approved by the Ministry of Health
Statement from Regional water supply
Support letter from the Ministry of Defence
Support letter from Civil aviation
Partial geological report

Design "System of coordinates" (foundations, crane site and construction site)
Permission for starting with the preparation of "Plot plan for the power line"
Mayor's order which approves laying of underground electricity lines through community land
Agreement for laying of underground electricity lines through community land
Agreement for laying of underground electricity lines through private land
Preparation of "Detailed urban plan"
Preparation of "Plot plan for the power line"
Preparation of "Plot plan for the road"
Approved project for "Building site" from the Ministry of Agriculture
Approved project of "Change of master plan"
Approved project "Detailed urban plan"
Approved project "Plot plan for the road"
Empowered "Detail urban plan"
Empowered "Plot plan for the power line"
Empowered "Plot plan for the road"
Statement of Ministry of Agriculture for "Changing the purpose of the land"
Certificate for changed purpose of the land "for producement of electricity"
Permission for starting industrial design
Preliminary contract for the grid connection
Preparation of "Conceptual plan - part geodesic (foundations and power lines)"
Preparation of "Conceptual plan - part Grid connection"
Preparation of "Conceptual plan - part Foundations"
Preparation of "Conceptual plan - part Roads"
Technical plan- part geological
Technical plan - part Foundations

Technical plan - part geodesic (foundations and power lines)
Technical plan - part Grid connection
Technical plan - part Road
Concerted statement from the Fire department in accordance with the current legislation
Construction permit
Final contract for grid connection
Construction procedure – containing more than 30 protocols that certifies that construction work is done in accordance with the requirements in the Law of spatial planning
Permit of use
Power purchase agreement
License for energy production

Do authorisation procedures take into account the specificities of the different renewable energy technologies? If yes, please describe how. If they do not, do you foresee a need to take them into account in the future?

- Up to this moment there is no significant distinction in permitting procedure of the different renewable energy sources. This distinction must be one of the most important goals during the composition of the new Renewable and Alternative Energy Sources and Biofuels Act.

Are there specific procedures, for example simple notification, for small scale, decentralised installations (such as solar panels on buildings or biomass boilers in buildings)? If yes, what are the process steps? Are the rules publicly available to citizens? Where are they published? Are the introduction of simplified notification procedures planned in the future? If so, for which types of installation / system?

- Current legislation does not provide different conditions during permitting procedures for small scale or for domestic producers. The procedure for solar panels on buildings is the same as procedure for wind power plants on field. This is another significant disadvantage of current Bulgarian legislation. This disadvantage prevents private initiative and leads to very low energy efficiency and indirectly to a negative attitude of the citizens towards renewable energy. People mainly associate green energy as expensive energy and on the same time they are not able to use renewable energy for saving money.

- Probably in the new Law for renewable sector will be some simplified procedures for domestic producers (small wind and solar installations).

What information and assistance is available to potential applicants for new renewable energy installations on their applications?

- There are no official statistics or any other data that potential applicants could use and rely on. Some NGO's publish information on their web sites but data is contradictory. Regarding legal base potential investors are forced to familiarise with more than 20 legal acts and ordinances.

What are the fees associated with applications for authorisation/ licences/ permits for new installations? How are these related to the administrative costs of granting such permits? Where are the fees published? Is there any plan to revise these fees?

- Concerning fees related with the permitting procedure the situation has two is following: Ministry of Environment and Waters, Ministry of Health or Ministry of Agriculture and Food have their own written tariff and their local divisions observe these tariffs. On the other hand local municipalities have their own fees for one and the same services. If the region is not very attractive for the investors – fees are not so big. Where the potential is greater – fees are going up.

Tariffs of the ministries mentioned above are following:

- *Tariff № 10 for the fees collected by the ministry of health according to the law of the state fees*
- *Tariff № 14 for the fees, collected in the system of the ministry of regional development and public works and by the regional governors*
- *Tariff for the fees, which are paid in the system of the Ministry of Environment and Waters*
- *Tariff for the fees, which are paid at change of the rededication of the agricultural lands*

Unfortunately most of the local municipalities are working in contradiction with the tariffs mentioned above.

Is official guidance available to local and regional administrative bodies on planning, designing, building and refurbishing industrial and residential areas to install equipments and systems using renewable energy sources in electricity and heating and cooling, including in district heating and cooling? If such official guidance is not available or insufficient, how and when will this need be addressed?

- There is a guidance published by Ministry of Economy, Energy and Tourism three years ago. The content information is very old and mostly useless.

Technical specifications

To qualify for government support, to meet requirements under a renewable energy obligation or for simple installation, do renewable energy technologies need to meet

certain quality standards? If yes, which installations and what quality standards? Are there national, regional or city codes or standards that go beyond European standards?

- Bulgarian Institute for Standardisation has adopted all applicable standards related with renewable energy sources.

Buildings

a) National legislation concerning renewable energy use in buildings:

- Law of energy efficiency.

b) Responsible Ministry/ authority:

- Ministry of Economy, Energy and Tourism.

c) Reform, if any, foreseen by:

- There is no official information regarding this issue.

d) Specific measures at regional / local levels:

- Agency of Energy Efficiency.
- On local level all Municipalities have a division called "energy efficiency division" mainly responsible for development of the energy efficiency in all buildings that belong to the Municipality.

e) To what extent is the increased share of renewable energy in the building sector due to energy efficiency improvements, including the use of cogeneration, passive, low and zero energy buildings?

- There is no official information regarding this issue.

f) Are there minimum requirements for the use of renewable energy in building regulations and codes? In which geographical areas and what are these requirements? In particular, what measures have been built into these codes to ensure the share of renewable energy used in the building sector will increase? What are the future plans related to these requirements / measures?

- Required parameters and applicable approach of measuring are defined in both Ordinances (Ordinance № RD-16-1057 and № RD-16-1058 of 10.12.2009).
- There are not specific requirements regarding geographical areas.

g) What is the projected increase of renewable energy use in the building sector (residential – if possible differentiating between "single-unit" and "multiple unit", commercial and industrial) until 2020?

- There is no official information regarding this issue

- h) **Have obligations for minimum levels of renewable energy in new and newly refurbished buildings been considered in national policy? If yes, what are these levels? If not, how will the appropriateness of this policy option be explored by 2015?**
- Yes, there are minimum levels of renewable energy in new and newly refurbished buildings.
 - These levels are defined in Ordinance № RD-16-1057 of 10.12.2009
- i) **Please describe plans for ensuring the exemplary role of public buildings at national, regional and local level by using renewable energy installations or becoming zero energy buildings from 2012 onwards, also in line with the recast of EPBD?**
- All energy efficient buildings have some minimum tax benefits. One encouraging approach could be low interest credits for construction and refurbishment of public buildings.

Information provisions

Information and advice play an important role for making investors, end users or other decision makers aware of the benefits and possibilities of using renewable energy sources. Current information campaigns, programmes, as well as planned revisions, and expected results should be described. Member States should also indicate which responsible authority will monitor and review the effects of the programmes. When regional / local authorities have a substantial role, please also explain it.

- a) **National legislation concerning information requirements according to Article 14 of the Directive:**
- There is no official information regarding this issue
- b) **Responsible body/(ies) for dissemination of information at national / regional / local levels:**
- It shall be Ministry of Economy, Energy and Tourism in cooperation of Ministry of education and science and Ministry of Regional development and Public work
- c) **Specific measures at regional / local levels (where relevant):**
- There is no official information regarding this issue
- d) **Are there specific trainings for case handlers in the different authorisation bodies?**
- There are some activities at local level regarding Energy efficiency law only. Regarding production or renewable energy there is no information or other PR campaign, and because of this public attitude towards renewable sources is mainly negative.
- e) **Please indicate information which is available on supporting measures for the use of renewable energy sources in electricity, heating and cooling and in transport. Who is responsible for the adequacy and the publishing of this information? Are there specific information resources for the different target groups, as end consumers, builders, property managers, property agents, installers, architects, farmers, suppliers of equipment using renewable energy sources, public administration? Are there**

information campaigns or permanent information centres in the present, or planned in the future?

- In accordance with Energy Efficiency Law there are some tax benefits for energy efficient buildings.
- f) **Who is responsible for publishing information on the net benefits, costs and energy efficiency of equipment and systems using renewable energy sources for heating, cooling and electricity? (Supplier of the equipment or system, public body or someone else?)**
- The responsibility is mainly belongs to the Ministry of Economy, Energy and Tourism and Agency of energy efficiency managed by the same Ministry .
- g) **How is guidance for planners and architects provided in order to help them to properly consider the optimal combination of renewable energy sources, high efficiency technologies and district heating and cooling when planning, designing, building and renovating industrial or residential areas? Who is responsible for that?**
- These regulations are defined in Ordinance, issued according art. 169, paragraph 1 and paragraph 4. Ministry of Regional development and Public work is responsible for this ordinance. The ordinance is issued on the ground of obligation defined in the Law of the spatial planning
- h) **Please describe the existing and planned information, awareness raising and training programmes for citizens on the benefits and practicalities of developing and using energy from renewable sources. What is the role of regional and local actors in the design and management of these programmes?**
- There is no official information regarding this issue

Certification of installers

- a) **National legislation concerning certification or equivalent qualification schemes for installers according to Article 14(3) of the Directive:**
- There is no specified legal base regarding these issues. According to the current legal base all installers of renewable energy sources are equated to electricians and they have to meet the criteria for electricians.
- b) **Responsible body/(ies) for setting up and authorising certification / qualification schemes by 2012 for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps?**
- Responsible bodies could be new branch chamber. Such a chamber could be administrating by Ministry of Economy, Energy and Tourism.
- c) **Are such certification schemes / qualifications already available? Please, describe them.**
- No, there are not certain certification schemes.

4.2.6 Electricity infrastructure development

Besides the current situation and already existing legislation future actions, planned revisions, responsible bodies for it and expected results should be described.

National legislation concerning requirements related to the energy grids:

a) How is it ensured that transmission and distribution grids will be developed with a view to integrating the targeted amount of renewable electricity while maintaining the secure operation of the electricity system? How is this requirement included in the transmission and distribution operators' periodical network planning?

- There are three distribution companies (CEZ, EVN, E.ON) that are obliged to provide grid connection to all renewable energy projects up to 5 MW capacities. If they are able to provide a grid connection to the project above 5 MW capacities they are obliged to do this.

If they are not able to secure grid connection for these bigger projects they forwarded the request to the transmission company - NEK AD.

The important thing in this case is that CEZ, EVN and E.ON must prove that they do not have technical capability to provide grid connection in order to transfer the request to the NEK AD.

The NEK EAD is obliged to assure the grid connection for projects with more than 5 MW capacities. These obligations are defined in the renewable energy law also. The costs for connecting the power plants to the respective network up to the property boundary of electrical installations are the responsibility of the producer. Cost associated with the expansion and reconstruction of the transmission and the distribution network required to connect generator are the responsibility of the respective transmission and distribution companies.

One more significant problem happens to be lack of communication between distribution companies and NEK. NEK is not informed of the grid capacity provided from the distribution companies to small producers.

All grid companies must provide their investment plans for expansion and maintaining of the grid to SEWRC for adoption and this information should be available for all decision makers. This is defined in the legislation. In practice grid companies do not provide such information to SEWRC and there is no official information concerning development of the grid network.

The security of the grid network is a responsibility of Transmission System Operator. This company is owned by NEC and provides following services:

- Operational regime planning and control of the electrical power system of the Republic of Bulgaria
- Synchronisation of the Bulgarian electrical power system operation in parallel with the electrical power systems of the European countries member of the UCTE and coordination of the joint operation with other electrical power systems
- Operation, overhaul and maintenance of the transmission network
- Organisation of the balancing energy market

b) What will be the role of intelligent networks, information technology tools and storage facilities? How will their development be ensured?

- Until to now nothing related with smart grid system was implemented.

Is the reinforcement of the interconnection capacity with neighbouring countries planned? If so, which interconnectors and by when?

- There is no official information regarding this issue

c) How is the acceleration of grid infrastructure authorisation procedures ensured? What is the current state, average time for getting approval? How is this going to be improved? (Please refer to current status and legislation, bottlenecks detected and plans to streamline procedure with timeframe of implementation and expected results.)

- There is a legal possibility (stipulated in the Energy law) the usual permitting procedure related with grid infrastructure to be facilitated. This facilitation is powerful for all energy assets.
- The time needed for the approval procedure depends on the grid length. The procedure could be very short if the investor is planning to pass through municipal land. In case of passing through private land the procedure is longer and more expensive. If the private owner refuses to provide a "right of passing" of the underground cables or overhead gridline there is an administrative procedure for official compensation and office vesting right of passing and laying. The amount of the compensation is determined by expert assessor. The disadvantage of this procedure is its longer duration especially if the private owner decides to use the legal possibility for administrative appeal. If the grid is overhead instead of servitude rights the investor should receive vesting right of construction for the reinforced concrete pole. The common procedure is related to designation of a plot plan and its adoption and entry into force.

d) How is coordination between grid infrastructure approval and other administrative planning procedures ensured?

- Grid infrastructure approval procedures are similar with other planning procedures.

e) Are there priority connection rights or reserved connection capacities provided for new installations producing electricity from renewable energy sources?

- One of the most significant legal advantages "Art. 9 paragraph 4 and art. 13 paragraphs 2 - Priority connection to the distribution network of RES power plants" becomes the most significant obstacle to the developers.
- Reservation of grid capacity is possible only for a period of two years from the date of signing of the preliminary contract for grid connection. After this contract expires and the grid capacity is no longer considered "reserved". This regulation is defined in Ordinance No 6.
- There is not distinguishing between new or repowered installations. Unfortunately this advantage, recently, is only on paper because of lack of capacity.

f) **Are there renewable installations that are ready to come online but are not connected due to capacity limitations of the grid? If so, what are the steps taken to solve this and by what time is this expected to be solved?**

- A lot of wind power plants constructed recently are ready to come online but because of lack of capacity this could be delayed. In this case investors have two possibilities to wait or to construct at their own expense needed grid line. In most cases with missing capacity investors are forced to construct the grid at their own expense and then they are obliged to donate constructed grid to the distribution companies. If they refuse to donate or request a payment equal to their expenses they are disconnected from the grid.
- Second option is available only if there is unused capacity in the substation. According to the current legislation the grid companies are not obliged to pay any penalties in case of "non existing grid capacity".

g) **Are the rules on cost sharing and bearing of network technical adaptations set up and published by transmission and distribution system operators? If so, where? How is it ensured that these rules are based on objective, transparent and non-discriminatory criteria? Are there special rules for producers located in peripheral regions and regions with low population density?**

- There aren't any official rules for cost sharing. State Energy and Water Regulatory Commission is obliged to require investment plans of the transmission and distributions companies and on this basis to establish rules for cost sharing. Unfortunately up to this moment such information is not provided by the SEWRC.

h) **Please describe how the costs of connection and technical adaptation are shared between producers and transmission and distribution system operators? How is it ensured that transmission and distribution system operators are able to recover these investment costs? Is any modification of these cost-bearing rules planned in the future? What modifications are you foreseeing and what results are expected from them?**

- According to the current legislation all expenses must be covered by transmission and distributions companies.

i) **Are there rules for sharing the costs between initially and subsequently connected producers? If not, how will this be ensured?**

- There are no written regulations for sharing the costs between initially and subsequently connected producers. According to the current legislation private investors are not allowed to own and maintain grid infrastructure because of the fact that these activities are subject to a license.

j) **How will it be ensured that transmission and distribution system operators provide new producers wishing to be connected with the necessary information on costs, precise timetable for processing their requests and an indicative timetable for their grid connection?**

- Transmission and distribution system operators provide to the investors "Statement for technical possibilities and methods for grid connection. These statements are not legally binding for both parties. These statements are needed during permitting process until investors obtain a "Permit for starting industrial design". After this permit investors have the possibility to apply for Preliminary Interconnection contract. Usual approach of Transmission and distribution system operators is in these preliminary contracts to define a deadline only in favour of the grid operator. If the investor is not ready with the construction process by the deadline the obligations of the grid operator are cancelled. There are no response obligations for the grid operators regarding readiness of the grid. Investors are not able to ask for any compensation.

4.2.7 Electricity network operation

a) How is the transmission and distribution of electricity from renewable energy sources guaranteed by the transmission and distribution system operators? Is priority or guaranteed access ensured?

- According to the current legislation transmission and distribution operators are obliged to provide priority grid connection for all renewable sources. They are also obliged to purchase the whole amount of the produced electricity.
- Unfortunately present situation is different than the legal base. A lot of projects are waiting for grid connection, and other projects are limited.

b) How is it ensured that transmission system operators, when dispatching electricity generating installations give priority to those using renewable energy sources?

- Unfortunately there are no official regulations regarding this issue

c) How is it ensured that grid and market related operational measures are taken in order to minimise curtailment of electricity from renewable energy sources? What kinds of measures are planned and when is implementation foreseen?

- Unfortunately there are no official regulations regarding this issue

d) Is the energy regulatory authority informed about these measures? Does it have any competence to monitor and to enforce implementation of these measures?

- There is a working group called by SEWRC for establishment of Energy trade rules.

e) Are plants generating electricity from renewable energy sources integrated to the electricity market? Could you please describe how? What are their obligations?

- There is no official information regarding this issue. Current system includes purchase of whole produced electricity on preferential prices.

- f) What are the rules of charging transmission and distribution tariffs to generators of electricity from renewable energy sources?

4.2.8 Biogas integration into the natural gas network

- a) How is it ensured that charging of transmission and distribution tariffs is not discriminating against gas from renewable energy sources?
- There is no official regulation regarding this issue
- b) Has any assessment been carried out at national or regional level on the need to extend gas network infrastructure to facilitate the integration of gas from renewable sources? What is the result? If not, when and who is going to carry out such an assessment?
- There is no official regulation regarding this issue
- c) Are technical rules on network connection and connection tariffs for biogas published? Where are these rules published?

District heating and cooling infrastructure development

- a) Please provide a detailed assessment on the need for new district heating and cooling infrastructure using renewable energy sources and contributing to the 2020 target. What are the plans for such infrastructures? How will these plans be promoted? What are the planned contributions of large biomass, solar and geothermal facilities in the district heating and cooling systems?
- There is no official statement from the government regarding any intentions on this field.

Financial support

The Financial support can be classified in various ways. The most common distinction is between investment and operation aid. You can find examples for both types below:

- 1. investment aid: investment subsidies, capital grants, low interest loan, tax exemption or reduction, tax refund, tender schemes*
- 2. operational aid: renewable energy obligation with or without green certificates (tradable green certificates), feed-in tariffs, feed-in premiums, voluntary schemes, tender schemes, fiscal incentives on production*

- a) What is the name and a short description of the scheme?

- The financial support mechanism is defined in Renewable and Alternative Energy Sources and Biofuels Act.
- Art. 21 paragraph 1-3 – every year not later than March 31st the SEWRC shall determine the preferential prices for purchasing the produced energy (excl. produced energy of hydroelectric plants with capacity more than 10 MW). The preferential price is determined to be 80% of the average sale price for the public utility of end suppliers for the preceding calendar year, plus an addition (which must not be less than 95 % than the addition in the previous year) calculated by the SEWERC depending upon the renewable technology. This approach does not allow decreasing of the preferential prices for the future.
- The old obligation defined in Paragraph 3 from transitional provisions of the Energy Efficiency law – obligatory purchase of produced energy for 12 years now is changed to 15 years. This preferential price was for all power plants that will begin to produce by 31.12.2010. Now this dead line is 31.12.2014.
- There is a support scheme for energy efficiency and renewable energy provided via Bulgarian banks by EBRD. This scheme provides 20% grant for energy efficiency projects and 15% grant for renewable energy projects

b) Is it a voluntary or obligatory scheme?

- The financial support mechanism defined in the legal act mentioned above is obligatory

c) Who is managing the scheme?

- The financial support mechanism is defined in Renewable and Alternative Energy Sources and Biofuels Act. This legal act is administered by the Ministry of Economy, Energy and Tourism but definition of the pricing and price definition every year is priority for SEWRC.

d) Is the scheme periodically revised? What kind of feed-back or adjustment mechanisms exist? How the scheme has been optimised so far?

- This financial support mechanism become powerful since its entry into force and now it has not been revised.
- The EBRD funds are complemented by the Kozloduy International Decommissioning and Support Fund (KIDSF) grant funding.

Is there differentiation of the support according to technologies?

- The support mechanism and definition of pricing are the same for all technologies, but final purchase prices are different.

e) What are the expected impacts in terms of energy production?

- The expectations are that this scheme will provide the producers more security during the development process, will secure their incomes in advance and will convince the banks that the environment in this sector right now is less risky. In spite of this the mechanism provides more security to wind power plants in comparison with solar installations.

f) Are there maximum or minimum sizes of system which are eligible?

- There are no certain criteria regarding sizes of system

g) Is it possible for the same project to be supported by more than one supporting measure? Which measures can be cumulated?

- Yes, both support mechanisms could be applied for same project.

Specific questions for investment aid:

a) What is granted by the scheme? (*subsidies, capital grants, low interest loan, tax exemption or reduction, tax refund*)

- EBRD scheme provides 20% capital grant for energy efficiency projects and 15% capital grant for renewable energy projects

b) Who can benefit from this scheme? Is it specified for certain technology(/ies)?

- Sub-borrowers must be private enterprises, firms, businesses, sole proprietors or other private legal entities formed under the laws of the Republic of Bulgaria and operating in the Republic of Bulgaria. Sub-borrowers may not be majority-owned or controlled by the Republic of Bulgaria, or by any other political, governmental or administrative body, agency or sub-division thereof.
- Sub-borrowers may not be companies engaged in production, marketing, distribution (or similar activity) of tobacco products, hard liquor, alcohol, gambling, arms, and activities listed on the Environmental Exclusion and Referral List of the EBRD.

c) Are applications continuously received and granted or are there periodical calls? If it is periodical, could you please describe, frequency, conditions?

- There are not periodical calls. The grant is adopted at the end of the project if the project is realised in accordance with the requirements.

Specific questions for tradable certificates: There is no procedure for trade of certificates.

Conclusion

The role of renewable energy in Bulgaria has become more and more important ever since the country has become full member of the European Union and subsequently joining in the efforts to produce clean and reliable energy for its future needs. There is significant potential for increasing the share of green energy in all three energy sectors and the indicative target of 16% share of renewable energy sources in the final gross energy consumption should not be problematic to reach.

A trend worth mentioning is the projected increase of electric energy usage and production not only in the Electricity energy sector, but also in the Heating and Cooling energy sector, and Transportation as well. The reasons behind such a transition are the current energy mix of the country, in combination with its dependence on imports, and the need for improving the efficiency of the energy sector as a whole in terms of production and environment protection. In the Heating and Cooling sector, electricity consumption has begun to increase its share at the expense of solid biomass, while in the Transport sector, a more extensive use of electricity-powered trains and automobiles is expected.

As a result of the EU incentive for RES development through the adoption of directive 2009/28/EC, Bulgaria has made a big step toward implementation of new technologies for generation of power.

The implementation of feed-in tariffs, in combination with the undeveloped potential of renewable energy sources, has resulted in serious investor interest in wind and solar energy. Depending on the government policy-making and future legal framework, we expect solid biomass, biogas and bio waste facilities, geothermal and solar thermal and bio fuels to attract additional interest in the period 2010-2020 and further diversify and supplement the renewable energy mix in Bulgaria.

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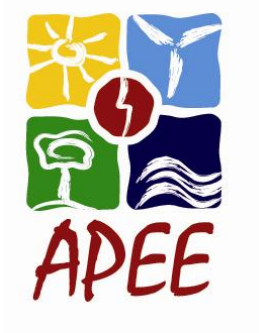
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Annex A:

Glossary and terms

No.	Abbreviation	Description
1	EU	European Union
2	RES	Renewable energy sources
3	RAESBA	Renewable and Alternative Energy Sources and Biofuels Act
4	EC	European Commission
5	SEWRC	State Energy and Water Regulatory Commission
6	MRDPW	Ministry of Regional Development and Public Works
7	NEC	National Electric Company
8	HPS	Hydro Power Station
9	TPS	Thermal Power Station
10	EE	Energy Efficiency
11	MV	Motor vehicle
12	PV	Photovoltaics
13	GDP	Gross domestic product
14	CCS	Carbon capture and storage
15	CO ₂	Carbon dioxide
16	GHG	Greenhouse gas
17	KPIs	Key Performance Indicators
18	kWh	Kilowatt/ hour
19	MW	Megawatt
20	GWh	Gigawatt / hour
21	ktoe	(Kilo)Ton oil equivalent



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